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ABSTRACT

This report summarizes the most important findings in a study designed to investigate the linkages between education and fertility in the United States. The data base for this investigation is the National Longitudinal Survey (NLS) of women aged 30 through 44 by the Bureau of Census. The basic hypothesis is that education will affect fertility and that fertility and marriage decisions will affect educational choice. Results indicate that a woman marrying and having her first child at age 16 will complete 3.5 fewer years education than a woman who never marries. Educational choice is significantly affected by the individual's socioecoromic status--as reflected in parents' education and occupation--and by attitudes towards housework and child care activities. The total cost of children, both explicit and implicit, varies not only with family size, but also with the timing of family formation. It is apparent that if child births are delayed until the mother has completed her formal education, then the foregone education costs of fertility will be minimal. (Author/DE)

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Final Report

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EDUCATIONAL INPUT AND FERTILITY RESPONSE

Paul R. Gregory, Principal Investigator

INTRODUCTION

This report summarizes the most important findings of our study of educational input and fertility response funded by the National Institute of Education (Grant number: NE-G-00-3-0171). This research was initiated in September of 1973, and its principal objective was to investigate the linkages between education and fertility in the United States. The data base for this investigation was the National Longitudinal Survey (NLS) of women aged 30-44 designed by the Center for Human Resources Research of Ohio State University and undertaken by the Bureau of Census. Some delay in our research was caused by the lack of availability of the revised NLS tapes until March of 1974, prior to which time, we were forced to work with the original and error-prone census tapes.

We are currently preparing a monograph on fertility, educational choice, and labor force activity, which reports in considerable detail our educational choice and fertility response results. This monograph (length 400 pages) should be finished within two months of this date and will be submitted to the

National Institute of Education, whose support of the fertility and educational choice sections will be duly noted. For now, we provide a summary of our methodology and principal findings.

SUMMARY OF FINDINGS

Our basic working hypothesis was that the major aspects of household decision making--education, family size, labor force status, hours worked, marriage, etc.--are interwoven and that one must study these decisions in terms of an integrated household model. Focusing on the linkages between educational choice and fertility, our basic hypothesis was that education will affect fertility and that fertility and marriage decisions will affect educational choice. The reasoning behind this latter point is that the decision to marry and the arrival of children will have obvious impacts on the acquisition of education by women. In fact, we have hypothesized that the earlier the marriage and the earlier the arrival of the first child, the lower the number of years of schooling of the wife, and we view this loss of education as one of the major costs of fertility and early marriage, which must be borne by the woman. The unique feature of these fertility-associated costs, however, is that unlike other fertility-related costs (both direct outlays for children and the loss of income during the child raising years), they are uniquely related to the timing of children and marriage and can be largely avoided

if marriage and family formation is delayed.

To determine the empirical relationship between fertility and educational choice, we estimated separate regression models of completed family size and education choice. Our completed family size model postulates that completed family size will depend upon the "price" (cost) of children, family income, education of the husband and wife, and attitudinal and demographic control variables. The market wage rate of working wives was employed as their "price" of children (the cost of their time) and we used three separate opportunity cost measures (reservation wage, potential market wage, value of home time) for nonworking wives. Moreover, we experimented with a wide variety of income concepts in an attempt to determine the true impact of income on family size.

Our most important findings from the fertility models were that income effects on fertility are quite small but positive and that the "pure" income elasticity is around 3.5%, e.g., that a doubling of family income (holding price effects constant) will increase completed family size by 3.5%. The impact of the price variable is much more substantial with substitution elasticities ranging from -20% to -40% depending upon the variant employed to measure the opportunity costs of nonworking wives. Thus a doubling of the wife's wage will cause a 20% to 40% reduction in completed family size--a notable impact in view of the relatively small

amount of secular change in completed family size over the past century.

Our findings for education are that the gross fertility impact of the wife's education is substantial, with an education elasticity of around -35%, e.g., a 10% increase of the wife's formal schooling would reduce completed family size by 3.5%, and this is a fairly substantial impact in view of the large secular increase in education in the United States. However, when one nets out the impact of education on the price of the wife's time, education's "pure" effect on fertility is substantially diminished to elasticities of around -10%, which are not very significant in both a quantitative and statistical sense. The pure education effect should capture education's impact on fertility control and attitudes and should be independent of education's impact on income and price effects. A surprising finding is the quantitatively more important role of husband's education in restricting family size--a result contrary to much past research.

In general, we find that economic variables (both including and excluding education) do "matter" as fertility determinants, although our fertility regressions tend to be dominated by the age at which the respondent first marries.

Turning to our educational choice results, we find that the timing of marriage and children does have a notable impact on

ducational attainment. For every year prior to age 22 the woman marries (has her first child), years of completed schooling decline by .24 (.20) years. Thus a woman marrying and having her first child at age 16 will complete 1.5 (1.2) fewer years than a woman marrying at age 22 and she will acquire 3.5 years less education than a woman who never marries. Moreover, we relate educational choice to a wide variety of socioeconomic background and attitudinal variables, and find that educational choice is significantly affected by the individual's socioeconomic status (as reflected in parents' education and occupation) and by attitudes towards housework and child care activities. We note further that age of marriage and age of first birth tend to be inversely related to socioeconomic background; so the socio-economic effect may capture some marriage and birth effects.

SOME FURTHER CONSIDERATIONS

Our investigation of the determinants of educational choice indicates rather clearly that marriage and family formation, occurring prior to the completion of formal education, impose costs in terms of foregone education. Holding the respondent's socioeconomic background constant, we find that a woman who marries and has her first child at the age of sixteen will tend to acquire 3.5 years less education than her counterpart who never marries and never has children. When viewed relative to

the sample average of 11.5 years of completed education, our results suggest an eighth grade education for the sixteen year old wife-mother, who otherwise would have had all the attributes necessary to yield an average level of education. To take the less extreme case of a woman marrying at the age of eighteen and having her first child at the age of 20, our results indicate that she will complete approximately two years less education than her unmarried counterpart with otherwise identical attributes. Moreover, we should stress that these calculations attempt only to identify the net effects of children and marriage by holding socioeconomic background and attitudinal attributes constant. The observed gross effects will, of course, be much larger because of the relationship between early marriage and early births and socioeconomic background.

Thus one of the costs of fertility, often neglected in the literature, is the loss of education foregone due to early marriage and the early arrival of children. This cost is uniquely related to the timing of births and marriage and can be largely avoided if marriage and family formation are delayed until the female's education is complete. Following this line of reasoning one step further, we conclude that the total cost of children, both explicit and implicit, will vary not only with family size but also with the timing of family formation. Concentrating on the implicit costs alone, it is apparent that if child births are

delayed until the mother has completed her formal education, then the foregone education costs of fertility will be minimal. On the other hand, if these births occur during the educational process, the likelihood of interruption of education increases and foregone education costs must be borne. These costs may take on a monetary form in terms of a loss of potential human capital and, subsequently, of earnings. Available studies of returns to female education, suggest substantial annual rates of return to education (around 15 percent) between a junior high school and completed high school education. In our example above, the female who marries and has her first child at the age of sixteen will forego a high school education and as a result would forego the substantial rate of return to a high school education. Foregone earnings in the case of the female marrying at the age of eighteen and having her first child at the age of twenty would be smaller yet still quite substantial: The foregone rate of return in her case would be around ten percent.

Foregone education leads not only to monetary losses but also to a decline in the opportunity cost of time in the home insofar as this is generally linked with the education of the wife. Thus the loss of education due to early marriage and births will depress the value of time in the home as well as labor force time and this general lowering of the value of time may lead to substitution effects in favor of larger family sizes.

Again the circle is closed in that marriage and births lower fertility costs, while lower fertility costs promote larger family sizes.

Foregone education represents only one implicit cost factor which will vary with the timing of marriage and births. The timing of births in particular will affect the acquisition of work experience by women in view of the inverse correlation between the presence of preschool children in the home and labor force participation. Thus women with identical completed family sizes and of identical age cohorts can accumulate different amounts of work experience over their lifespans depending upon the timing of births. If births are bunched together, the cumulative number of years preschool children are present in the home is minimized and the amount of work experience is maximized.

This discussion suggests some simple hypotheses concerning the optimal timing of births and marriage: As the costs of fertility and marriage are greater if the marriage occurs prior to the completion of target education, marriage and first births will tend to occur after target education goals are attained. We stress the ceteris paribus nature of this argument, for other factors--the utility from having children while the parents are still young, the phenomenon of unplanned first births, the utility costs of delaying marriage, etc.--may serve to offset or dominate this education cost effect. Moreover, social and legal restraints

governing age of marriage and dictating that births should occur within marriage, prevent the timing of marriage and births from being an unconstrained choice. Also the timing of marriage and births may be closely related to cyclical economic conditions. Thus our ceteris paribus proposition concerning the inverse relationship between foregone education and the timing of births and marriage may be difficult to substantiate due to the interplay of these other factors.

The second simple hypothesis is that, as the loss of work experience (and lifetime earnings) will be minimized by the bunching of births, there will be a tendency to compress the interval between first and last birth rather than spreading births out over the entire fertile period. Again this ceteris paribus phenomenon would be difficult to establish empirically because of the presence of substantial offsetting factors, the most compelling of which is the strain of caring for a succession of infant children without a respite as well as the health implications of bunched births to the mother.

One could test these two propositions to some extent with the NLS data, at least in a reduced form sense, but this would require a major research effort far beyond the scope of this inquiry. Therefore, we limit our discussion to some rather casual comments based upon available time series evidence. It is true that the timing component of births has been subject to

change in the United States over the past half century in the direction predicted by our second hypothesis. Women born between 1891 and 1930 had 48 to 57 percent of their births before reaching the exact ages of 25-29; whereas the proportion projected for the 1936 to 1945 cohort is around 67 percent. Thus we do find an increasing trend towards greater bunching of births. However, when one examines these data more carefully, it becomes apparent that the growing concentration of births in the lower age ranges of the reproductive age cycle is largely the consequence of earlier marriages after the Second World War--a trend which is contrary to the first hypothesis. The percentage of lifetime fertility completed by interval since first marriage has remained remarkably stable over the past sixty years with roughly one half of fertility completed after five years of marriage and 70 percent completed after 10 years of marriage throughout this entire time interval. The fact that the available time series evidence provides only mixed support for the propositions that increases in opportunity costs will lead to later marriage and births and to greater bunching of births is not particularly damaging to the two propositions insofar as one can readily enumerate factors which may have served to offset these tendencies. In particular, the trend towards earlier marriage and lower ages at first birth could be tied to cyclical economic phenomena and to changing social institutions.

CONCLUSIONS

These remarks can impart only a general impression of our research, and we suggest that a complete understanding of our work can only be obtained by reading our forthcoming monograph entitled The Economics of Fertility, Educational Choice and Labor Force Behavior: Findings from the NLS Survey, which will be sent to your office within two months. In general, we feel that we have accomplished what we set out to do, and we are most grateful for the support of the National Institute of Education. The one area we were not able to deal with is the complex issue of intergenerational educational choice. The NLS does contain valuable information on the educational choice and educational goals of mothers and daughters, which would have been ideally suited for an intergenerational study, but time constraints prevented us from investigating this matter.

PUBLICATIONS

Several publications have emerged from this research. First, John M. Campbell's doctoral dissertation entitled: Household Demand: A Synthesis of Interdisciplinary Theory and Empiricism (U. of Oklahoma, 1975) was partially funded through this grant. Next, two papers presented at economics meetings were an outgrowth of this project, namely, Paul Gregory and R.W. Thomas, "The Economics

of Fertility: Some Preliminary Findings from the NLS Survey" A Paper presented at the Annual Meetings of the Southwestern Social Science Meetings, San Antonio, April 1975 and John Campbell and R.W. Thomas, "A Comparison of Alternative Limited Dependent Variable Estimators," A Paper presented at the Annual Meetings of the Western Economic Association, San Diego, 1975. Copies of these two papers are enclosed. The major publications from this study should be the monograph mentioned above and the various articles which will emerge from this monograph.

FINANCIAL REPORTS

The Office of Research of the University of Houston has submitted a final financial report for this project.